

SYSTEMS AND METHODS FOR DISTRIBUTED UTILITIES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation of U.S. patent application Ser. No. 14/269,742, filed May 5, 2014 and entitled System and Methods for Distributed Utilities, now U.S. Pat. No. 10,457,567, issued Oct. 29, 2019 (Attorney Docket No. M21), which is a continuation of U.S. patent application Ser. No. 10/566,307, filed Jan. 27, 2006 and entitled System and Methods for Distributed Utilities, now U.S. Pat. No. 8,718,827, issued May 6, 2014 (Attorney Docket No. E19), which is a '371 application of International Application Serial No. PCT/US2004/24335 filed on Jul. 28, 2004 and entitled Systems and Methods for Distributed Utilities (Attorney Docket No. E19WO), which claims priority from U.S. Provisional Patent Application Ser. No. 60/490,615 filed on Jul. 28, 2003 and entitled Systems and Methods for Distributed Utilities (Attorney Docket No. D90), and U.S. Provisional Patent Application Ser. No. 60/518,782 filed on Nov. 10, 2003 and entitled Locally Powered Water Distillation System (Attorney Docket No. E08), all of which are incorporated herein by reference in their entireties.

[0002] U.S. patent application Ser. No. 10/566,307, filed Jan. 27, 2006 and entitled Systems and Methods for Distributed Utilities (Attorney Docket No. E19), is also a continuation-in-part of U.S. patent application Ser. No. 10/714,683 filed on Nov. 13, 2003, and entitled Locally Powered Water Distillation System, now U.S. Pat. No. 7,340,879, issued Mar. 11, 2008 (Attorney Docket No. E11), which claims priority to U.S. Provisional Patent Application Ser. No. 60/425,820, filed Nov. 13, 2002 and entitled Pressurized Vapor Cycle Liquid Distillation (Attorney Docket No. C48), U.S. Provisional Patent Application Ser. No. 60/490,615, filed Jul. 28, 2003 and entitled Systems and Methods for Distributed Utilities (Attorney Docket No. D90), and U.S. Provisional Patent Application Ser. No. 60/518,782, filed Nov. 10, 2003 and entitled Locally Powered Water Distillation System (Attorney Docket No. E08), each of which is hereby incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0003] The present invention relates to the field of distributed utilities, and, more particularly, to distributed water purification systems and distributed power.

BACKGROUND ART

[0004] In many developing countries and remote areas without power plants and water purification plants, access to electricity and safe drinking water is a significant need. Often in such areas, poor financial resources, limited technical assets, and low population density does not make it feasible to build power plants and water purification plants to provide these resources to the population. In such circumstances, the use of distributed utilities may provide a solution. Distributed water purification systems, such as described in U.S. Provisional Application 60/425,820, and distributed electrical generators, such as diesel-powered internal combustion generators and generators based on the Stirling cycle, such as described in U.S. Pat. No. 6,253,550,

may be used to provide electricity and safe drinking water without the expense and delays associated with building and maintaining utility plants and the infrastructure required to bring the electricity and safe drinking water and to its point of use. With such the use of such distributed utilities, however, comes the need to appropriately distribute these utilities to the people who need them and to monitor the operation and correct usage of these systems.

SUMMARY OF THE INVENTION

[0005] In accordance with preferred embodiments of the present invention, a monitoring system for distributed utilities is provided. The monitoring system has a generation device for converting an available resource to a desired utility. The available resource may be water, in which case the generator is a purifier for providing potable water. Alternatively, the generator may convert a fuel to electrical power. In either case, an input sensor is provided for measuring one or more characteristics of the input to the generation device, while an output sensor is provided for measuring consumption or other characteristic of output from the generation device. The monitoring system has a controller for concatenating measured input and consumption of output on the basis of the input and output sensors.

[0006] Where the generation device, in the case, for example, of a particular utility of a network, is a water purifier, the input sensor may be a flow rate monitor. The output sensor may be a water quality sensor including one or more of turbidity, conductivity, and temperature sensors. On the other hand, where the generation device is an electrical power generator, the input sensor may include a fuel consumption rate monitor and the output sensor may include an electrical usage meter.

[0007] The monitoring system may also have a telemetry module for communicating measured input and output parameters to a remote site, either directly or via an intermediary device such as a satellite, and, moreover, the system may include a remote actuator for varying operating parameters of the generator based on remotely received instructions. The monitoring system may also have a self-locating device, such as a GPS receiver, having an output indicative of the location of the monitoring system. In that case, characteristics of the measured input and output may depend upon the location of the monitoring system.

[0008] In accordance with further embodiments of the invention, a distributed network of utilities is provided, including sources of purified water and sources of electrical power. The distributed network has generators for converting a resource into a useful utility, input sensors for measuring inputs to respective generators, output sensor for measuring consumption of output from respective generators, and a telemetry transmitter for transmitting input and output parameters of a specified generator. Finally, the distributed network has a remote processor for receiving input and output parameters from a plurality of utility generators.

[0009] In accordance with yet another embodiment of the invention, a method is provided for supplying distributed utilities. The method has steps of providing a generator to a user, monitoring at least one index of generator usage to supply a utility, and charging the user on the basis of the index of generator usage.

[0010] In accordance with other aspects of the present invention, methods are provided for assembling monitoring